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CANMET MONTHLY BIBLIOGRAPHY OF CRUSHING AND GRINDING - FEBRUARY 1980

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INTRODUCTION

This report presents bibliographical information on the subject of crushing and grinding for February, 1980. References were obtained through the CAN/SDI system covering the following data bases:

CHEMICAL ABSTRACTS (CA)	92: 4; 1980.
COMPENDEX (Engineering Index)	80: 1; 1980.
METADEX (Metal Abstracts)	80: 1; 1980.
NTIS (National Technical Information Service of the U.S. Dept of Commerce)	80: 4-5; 1980.
SCIENCE CITATION INDEX	79: 47; 1979. 80: 1-4; 1980.

The following abstract journals were also searched:

IMN ABSTRACTS	30: 1-2; 1980.
CURRENT AWARENESS IN PARTICLE TECHNOLOGY	13: 2; 1980.

References are numbered sequentially and are grouped according to the main topics shown below. Not all topics need be presented in any one report.

A) Review articles
B) Crushing
C) Rod and ball mill grinding
D) Autogenous, semi-autogenous and pebble grinding
E) Liners and wear
F) Grinding media
G) Classification
H) Modelling, kinetics and process control
I) Fracture
J) Applications
K) Novel methods

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Review articles

1187. Steidl, D. "novelties and improvements in crushing technology: Acheme-79 review"; Chem Ind (Dusseldorf), 31:11:772-778; (German); 1979.

Crushing

1188. Faddeev, B.V. and Sirotkin, A.I. "Use of roto crushers in cyclic flow technology in flux quarries"; Sov Min Sci, 14:5:494-497; 2 ref.; Sept-Oct 1978.

1189. McDonald, J.F. "Design of crushing and screening equipment for different materials"; Workshop on aggregate and road base production with mobile equipment, Autralian Road Research Board, 500 Burwood Highway, Vermont south, Victoria, Australia; 143 pp.; 1979.

1190. Grahame, R.E. and Duncombe, M. "Mobile crushing and screening plant for road aggregates"; Workshop on aggregate and road base production with mobile equipment, Australian Road Research Board, 500 Burwood Highway, Vermont South, Victoria, Australia; 143 pp., 1979.

Rod and ball mill grinding

1191. Roloff, C.A. "The mechanical aspects of large grinding - mills"; Can Min Metall Bull, 72:811:81-88; 1979.

Demands for increased grinding production, lower-grade ore and limited capital have resulted in ever larger grinding mills, some as large as 36 ft (11 m) in diameter and 12,000 hp (8.950 kw). The result is often fewer machines per plant, with a greater dependence on each machine. To meet these reliability requirements, manufacturers of mills, drives, castings, and other components have had to be innovative and creative in their design. Only by thorough review of past designs and practices and by model studies confirmed in field tests can the manufacturer have full confidence in the product. Because of the great interest in large mills, a short review of larger machines is presented. This discussion covers material feeding, bearings, the rotating element, drive trains and material discharge. (Au).

1192. Durr, H. "Grinding stock crushing parts - sparator of stirred ball mills"; vt Verfahrenstechnik 13:23:951-953; (German); 1979.

Autogenous, semi-autogenous and pebble grinding

1193. Barratt, D.J. "Semi-autogenous grinding - comparison with the conventional route"; Can Min Metall Bull, 72:811:74-80; 1979.

This paper compares a number of operating conventional and semi-autogenous grinding circuits and analyzes them in regard to operating and capital costs, specifically as applied to porphyry copper ores. (Au).

Liners and wear

1194. Nillson, G. "Rubber lining design for grinding mills - influence on economy and capacity"; Can Min Metall Bull, 72:811:59-64; 1979.

There is a difference in design parameters between steel linings and rubber linings for grinding mills. The basic design parameters for rubber are described and a comparison is made between steel and rubber in different applications. (Au).

1195. Kolyshkin, M.V. and Krizherskii, A.Z. "Protecting the selective precleaning equipment of sintering machines from abrasive wear"; Metallurgist, 23:1-2:98-99; Jan-Feb 1979.

1196. Brussow, G. "Wear-resistant materials for the grinding members of roller-mills"; Aufbereit Tech, 20:10:573-576; (German); 1979.

Grinding media

1197. Shakhbazyan, T.O. and Mikhaelyan, V.G. "Activated charcoal waste as intensifiers for clinker grinding"; 5th Mater Resp Soveshch Neorg Khim; 108--110; (Russian); 1977.

1198. Deckers, M. and Stettner, W. "Effect of grinding-aids with special consideration of the mill conditions"; Aufbereit Tech, 20:10:545-550; (German); 1979.

Classification

1199. Anon. "Alternative to conventional screening devices"; Can Min Metall Bull, 72:812:110; 1979.

1200. Trawinski, H. "Centrifuges and hydrocyclones"; Chem Ing Tech, 51:12: 1158-1164; 14 ref.; (German); 1979.

1201. Subramanian, P., Shanmugasundaram, P. and Arunachalam, V.R. "Stage concept in particle size analysis"; Chem Eng Sci, 34:8:1070-1072; 1979.

1202. Leschonski, K. "Sieve analysis, the cinderella of particle size analysis methods"; Powder Technol, 24:2:115-124; 31 ref.; 1979.

1203. Kinsman, S. and Hoff, E.V. "New coulter-counter for particle-size analysis in the sieve range"; Powder Technol, 24:2:155-158; 6 ref.; 1979.

1204. Hidaka, J. and Miwa, S. "Fractionation and particle size analysis of fine powders by micro sieve"; Powder Technol, 24:2:159-166; 4 ref.; 1979.

Wet sieving of fine powders, usually considered the sub-sieve region, is discussed. The main trouble in a wet sieving operation is resistance due to surface tension of the dispersing medium passing through the sieve; this is the main reason why wet sieving of fine powders is difficult. A basic concept in the design of wet sieving equipment is shown. Fine powders are fractionated rapidly by using the sieving equipment with consists of ultrasonic vibrator, electromagnetic vibrator, and reciprocating pump. Quantitative data on the particle size analysis of fine powders in the size range 45-5 microns are given and compared with those obtained by other methods. (Au).

1205. Orr, C., Davis, D.K. and Camp, R.W. "Particle-size analysis by automatic siever"; Powder Technol, 24:2:143-149; 1 ref.; 1979.

Automation of the wet sieving process in an instrument for particle size analysis is described. A powder is consecutively subjected to three sieves of any selected meshes from 38 microns up and resulting fractions are collected individually, including both the undersize and oversize, in a submerged filter. The initial filter weight and the weights of all collected fractions are determined separately and stored in the microcomputer memory. Upon completion of an analysis, the sieved fraction weights are recalled, the total sample weight is calculated, and results are presented as weight per cent. Completion of each sieving step is established by filter weight constancy according to prearranged programming. Upon completion of an analysis, the system backwashes the filter and re-establishes conditions for the next analysis. Tests for accuracy with a standard material and repeated testing for short and long-term reproducibility are included. Applicability to a variety of powders is demonstrated. (Au).

1206. Martin, David L. "Hydrocyclone apparatus and method for underflow density control"; U.S. Patent 4, 174, 275; Jan 23, 1978.

1207. Bareket, N. and Poluianov, E.W. "An optical comparator for evaluation of fine sieves"; J Test Eval, 7:6:344-348; 1979.

An optical comparator for testing the compliance of fine sieves with existing standards was designed and built. It is a portable, low-cost instrument, featuring a range of magnification from x8 to x270 and scanning capabilities over a 30 cm diameter surface. The design principles are discussed and test results regarding the accuracy and speed of operation are presented. (Au).

1208. Anon. "ABC of classifiers: types and suppliers"; Vt Verfahrenslichnik, 13:12:964-969; (German); 1979.

1209. Barskii, M.D. and Govorov, A.V. "Multistage fractionation of polydisperse powders"; Theor Found Chem Eng, 12:6:778-781; 1978.

1210. Ballinger, K.W.A. and Jennings, B.R. "Rapid size measurement of sub-micron particles"; Nature (London), 282:5740:699-701; 1979.

The evaluation of particle size in colloidal suspensions is of considerable academic and commercial interest. The greatest uncertainty lies in the measurement of particles of sub-micron dimensions. We report here a novel method for particle sizing in this range which is rapid, ideally suited to rigid particles and can be adapted to commercial situations. It is based on the induction and measurement of birefringenece in a colloidal medium on its subjection to short pulses of high frequency ultrasonic power. (Au).

1211. Ward, C.W. "Oscillating air column method for the dry separation of fine and subsieve particle-sizes: sonic-sifter"; Powder Technol, 24:2:151:154; 1979.

The oscillating air column method of sieving is a recent contribution to the state of the art of dry particle separation. This paper describes the operating principle of both the laboratory instrument and the steady-state screener, pointing out variances from the more conventional methods of sieving. The results of tests and comments have been included to show experiences gained in working with a variety of metal powders. (Au).

1212. Ethirajulu, B. and Misra, D.D. "Electrical-separation of mineral raw materials"; Chem Eng World, 14:5:59-65; 1979.

1213. Metzger, K.L. and Schwedes, J. "New spiral air-classifier for abrasive material"; Aufberiet Tech, 20:10:589-590; (German); 1979.

1214. Petro, S. and Smirnow, S. "Separating limits with separation in coal preparation, and relevant calculation"; Fluckauf Forschungsch, 40:5: 233-239; (German); 1979.

1215. Baumbach, F. "Modern fine-sand processing with the Mogensen sizer"; Aufbereit Tech, 20:7:390d-395; 7 ref.; (German); July 1979.

1216. Schmidt, P. and Wesselbaum, F.J. "Screening machines with shape changing screen surfaces"; Aufbereit Tech, 20:7:363-368; 5 ref.; (German); July 1979.

1217. Haver, E.F. "Test sieve-table 1979"; aufbereit Tech, 20:7:369-373; (German); July 1979.

Modelling, kinetics and process control

1218. Domanowski, A., Derbsch, K. and Sommer, H.D. "Observations on regulation of grinding and separation systems in the cement industry"; Zement Kalk Gips, 32!10!513; (German); 1979.

1219. Pesl, Charlotte and Fejes, Pal. "Mathematical modeling of a continuously working separator"; Chem Ing Tech, 51:9:877-879; (German); 1979.

1220. King, R.P. "Model for the quantitative estimation of mineral liberation by grinding"; Int J Miner Process, 6:3:207-220; 1979.

1221. White, James Willian "A systems study of grinding as applied to mill scale operations"; US NTIS, PB80-102253; 32 pp.; April 1976.

1222. Domanowski, A. And Derbsch, K. "Fall of specific electric energy consumption during cement grinding by use of computer process control"; Silikattechnik, 30:8:227-230; (German); 1979.

1223. Fruhwein, P. "Mathematical-simulation as a tool for optimizing comminution processes with respect to particle-size distribution of product"; Ger Chem Eng, 2:5:305-311; 1979.

1224. Steir, K. "The milling circuit: its variables and control"; Ger Chem Eng, 2:5:298-305; 1979.

Applications

1225. Filimonov, V.A. et al. "Influence of the conditions of grinding a coke-pitch composition on the properties of fine-grained graphite"; Solid Fuel Chem, 13:5:95-99; 4 ref.; 1979.

The results are given of an investigation by the method of mathematical planning of experimentation of the influence of the condi-

tions of grinding of coke-pitch compositions on the properties of fine-grained graphite. The models obtained have been used for optimizing the process of preparing graphite under industrial conditions. (Au).

1226. Krokhin, V.P., Korchakov, V.G. and Yutina, A.S. "Study of the grinding of high-alumina cement in a vortex grinder"; Sb Tr Mosk Inzh Stroit Inst Im V V Kuibysheva Belgorod Tekhnd Inst Stroit, 23:77-84; (Russian); 1976.

1227. Ado, Kazuaki, Asai, Takashi and Nobuoka, Soichiro "Grinding and recrystallization of yellow iron oxide"; Osaka Kogyo Gijutsu Shikensho Kiho, 30:3:161-166; (Japanese); 1979.

1228. Brown, R.A.ST.C. "Cement factory at kuching, Malaysia"; NZ Eng, 34:6: 124-131; 3 ref.; June 15, 1979.

1229. Utsugi, Hiroshi et al. "Grinding and surface treatment of quartz in a reactive atmosphere in a ball mill"; Zairyo, 28:312:810-814; (Japanese); 1979.

1230. Bell, O.R. and Spratt, D.M. "Cliffs Robe River - the success story of an Australian iron or project"; Soc Min Eng AIME Annual Meeting; Feb. 18-22, 1979; Littleton, Colo.; 29 pp.; 1979.

1231. Lauer, O. "Method of particle-size measuring at super-fine powdery materials"; Aufbereit Tech, 20:12:677-687; (German); 1979.

1232. Luckie, P.T. et al "On the grinding of coal in oil"; 1st Proc of the Int Sump on Coal-Oil Mixture Combust; May 7-9, 1978; Petersburg Beach Fla.; Published by Mitre Corp. (Conf-7805); 1978.

1233. Fischer, L.E. and Hay, E. "Low-grade iron ore for high-quality steel: India's Kudremukh iron ore project"; Can Min Metall Bull, 72:810: 46-58; Oct. 1979.

The background for the 630-million-dollar-plus iron ore project at Kudremukh is outlined. The system and plans for mining, crushing,

concentrating, transporting via a slurry pipeline, filtering and ship-loading 7.5 million metric tons of iron ore per year are fully described. The mode of operation and the problems encountered in such a transfer of North American technology to developing countries are analyzed. Difficulties encountered during construction are discussed and the progress milestones made over a two-year period are enumerated. (Au).

1234. Birolini, P. and Sammartin, L. "Explosion properties of pulverized coal and taking them into account in the construction of coal grinding plants; Zement Kalk Gips, 32:12:613-616; (German); 1979.

The properties of coal dust/air mixtures with regard to explosion hazard are considered in the first part of this article. The second part takes account of these properties in connection with the design and construction of coal grinding plants. (Au).

1235. Feige, F. "Studies on fine grinding of limestone in a high-speed roller mill"; Zement Kalk Gips, 32:10:512; (German); 1979.

1236. Kisban, G. "Study on simultaneous grinding of clinker and fly ash"; Zement Kalk Gips, 32:10:512; (German); 1979.

1237. Anon. "Snow Lake Mill provides new copper-zinc opportunities for Hudson Bay"; Min Eng (New York), 31:9:1317-1320; Sept. 1979.

1238. Reder, R. "Prokuplje: a new processing-plant for pegmatite"; Aufbereiet Tech, 20:11:621-625; (German); 1979.

The paper describes in detail a plant for processing the pegmatites found in the area of Prokuplje (Yugoslavia). That plant consists of a two-stage primary crushing section and a primary grinding section. According to the introductory description of the raw material, it requires sorting by high-intensity magnetic separation and flotation. The concentrates are ground by the dry method. On the basis of the planning data, the paper quotes details of the process applied, material flow as well as of auxiliary and secondary equipment. Moreover, it specifies machine performance data. (Au).

1239. Russemeyer, H. "Crushing to accurate sizes with roller-mills"; Aufberiet Tech, 20:10:587-589; (German); 1979.

1240. Wolff, K. "Standardized screening decks made of polyurethane for screening machines"; Aufberiet Tech, 20:7:383-389; 10 ref.; (German); July 1979.

The paper reports on the present state of standardized screen desks made of polyurethane and steel which are used industrially for separating solid mineral raw materials on screening machines. A description of the different types with fastening bores and particulars of their structural components made of polyurethane and steel is followed by a critical investigation of these types of screen decks. Summarized information on additional system sieves for which either patent applications have been filed or which have been registered supplement the outline given on the present state of the art. The enumeration of a number of practical applications anticipates that system sieves of polyurethane will be used to an increasing extent. (Au).

1241. Reichert, H. and Schmidt, P. "Explosion-proof wobble-type screening machine"; Aufberiet Tech, 20:7:396-409; (German); July 1979.

Novel methods

1242. Anon. "Ultrasonic grinding of powders"; Res Disel, 187:618; 1979.